

**AccuGrade®**

**GPS Grade  
Control System**



## **Track-Type Tractors**

### **Machine Compatibility**

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**D3G, D4G, D5G**

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**D5N, D6N**

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**D6R II, D7R II**

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**D8T, D9T**



# AccuGrade® GPS Grade Control System

*Advanced GPS technology solutions move the design plan to the cab for greater operator control, increased accuracy, higher productivity and lower operating costs.*

The AccuGrade GPS Grade Control System is a high technology machine control and guidance system that allows dozer operators to grade with increased accuracy, without the need for survey stakes. Digital design data, in-cab operator guidance features and automatic blade controls help the operator achieve grade faster, meaning higher productivity, lower operating costs, and greater profitability.

AccuGrade GPS uses advanced Global Positioning System (GPS) technology to deliver precise blade positioning and control information to the cab. Using machine-mounted components, an off-board GPS base station, and Real Time Kinematic positioning, GPS provides the information necessary for the system to accurately determine blade positioning with centimeter level accuracy.

The AccuGrade system computes the positioning information on the machine, compares the position of the blade relative to the design plan, and delivers that information to the operator via an in-cab display. Information such as: blade elevation; how much cut/fill is necessary to achieve grade; visual indication of the blade's position on the design surface; and a graphical view of the design plan with machine location.

AccuGrade GPS puts all the information the operator needs to complete the job in the cab, resulting in a greater level of control. Vertical and horizontal guidance tools – in-cab display and light bars – visually guide the operator to desired grade. Automated features allow the hydraulic system to automatically control blade lift and tilt to move the blade to grade. The operator simply uses the guidance tools to steer the machine for consistent, accurate grades and slopes all day long resulting in higher productivity with less fatigue.

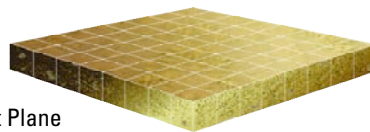
The AccuGrade GPS system is integrated into the machine electronics and hydraulic systems for optimum blade response time and maximum grade control in all conditions. The system integrated cab and joysticks allow even inexperienced operators to produce high quality results with minimal training.



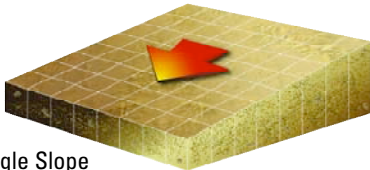
## Applications

AccuGrade GPS is designed for a wide range of construction earthwork applications, from bulk clearing with high production rates to finish grading with tight tolerances.

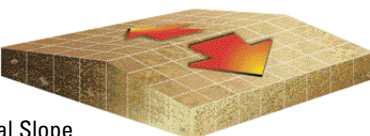
Flat, single and dual sloping planar designs, such as building pads, parking lots, roads and highways, can be created on-board the machine using the AccuGrade GPS system.



Flat Plane

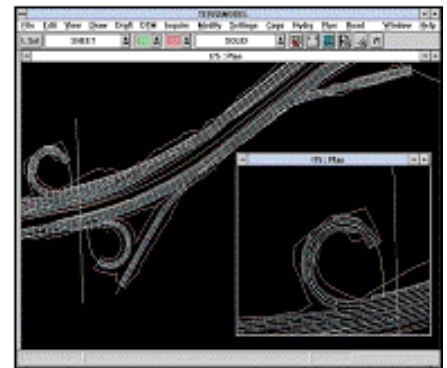


Single Slope



Dual Slope

Complex 3D designs, such as golf courses and roads with super elevations, can be created in the office by design engineers and loaded onto the system via a compact flash card.



The patented dual AccuGrade GPS system design provides total blade orientation by directly measuring both edges of the blade. The dual design is not restricted by angular range of a sensor on steep slopes, ensuring a true cross slope.

## Machine Components



**1) GPS Receivers (MS980C).** Two GPS receivers with integrated antenna are mounted on top of masts on each side of the blade.

GPS satellite signals received by the GPS receivers help define the horizontal and vertical position of the blade.

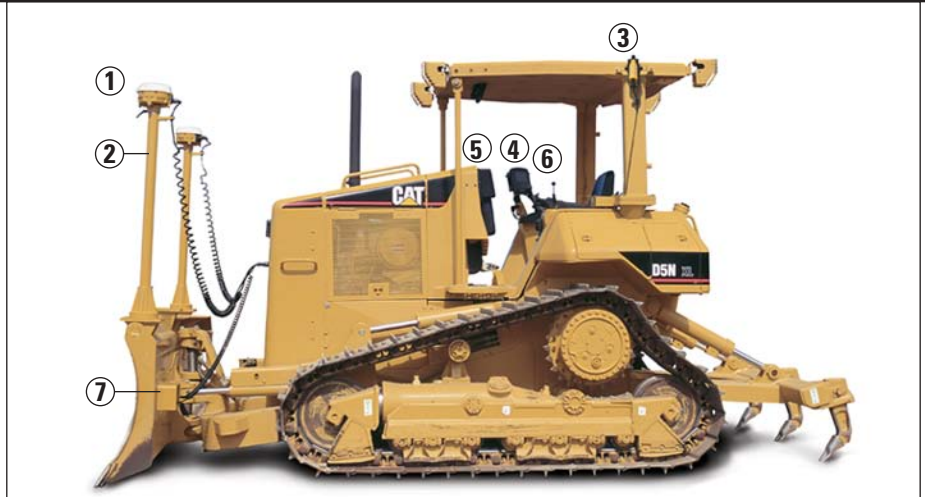
The GPS receivers allow the system to precisely measure the machine's blade location with real-time centimeter accuracy for precise blade control and machine guidance.

**2) Masts.** Two rugged steel masts are mounted on the blade. The masts are used to position the GPS receivers above the blade for optimum GPS satellite reception.



**3) Radio (TC900C/TC450C).** The communications radio is mounted on the cab. The radio antenna is mounted above the roofline of the machine to ensure maximum radio signal reception.

The radio receives real-time Compact Measurement Record (CMR) data from the GPS base station data radio. CMR information is used to calculate high accuracy GPS positions.



The broadcast frequencies work in all weather conditions and penetrate clouds, rain and snow. GPS can also accurately guide operations in fog, dust and at night.



**4) In-Cab Display (CD550A).** The in-cab graphical display with keypad allows the operator to interface with the system. It's designed for simple operation using push buttons and a color display screen. Settings and views can be configured according to operator preference. As the machine operates, the operator can view the machine, blade positioning and elevation information relative to design plan, in real-time.

The machine uses design files to execute the site design plan. The files are stored on a compact flash data card, which is inserted into a slot below the keypad, and transferred to the display.

The data card stores a number of file types, including: 3D site designs; linework; GPS, machine and display configuration files.

**Views.** The operator can work from five different display views.

- **Plan View** – a graphical guidance screen that displays an overhead view of the machine represented as an icon on the design plan. Also shows any line work associated with the site and the design.
- **Profile View** – displays a side view of the machine, represented as an icon and the profile (long section) of the design surface, represented by a line.
- **Cross-Section View** – displays a cross-section of the design surface drawn through the blade tip, and blade guidance information.
- **Text Views** – two configurable text screens allow basic guidance and status information to be displayed, such as: cut/fill, design elevation, slope/cross-slope, northing/easting/elevation, offsets, satellites, etc.



**5) Light Bars (LB400C).** Three light bars are mounted in the machine cab and provide vertical and horizontal guidance to the operator. Bright green indicates "on grade" and amber indicates "above" or "below" grade.



There are two “vertical guidance” light bars – one for each side of the blade. The vertical light bars visually indicate whether the blade is above grade, on grade or below grade. The left light bar provides guidance to the left blade tip. The right light bar provides guidance to the right blade tip.

The center light bar provides “horizontal guidance” and indicates the horizontal location of the blade relative to the selected horizontal alignment.

**6) Remote Switches.** The remote switches are located on the lift/tilt control in the cab. They are used to activate the operating modes.

- **Auto Mode** – the system automatically controls blade lift and tilt to move the blade to grade.

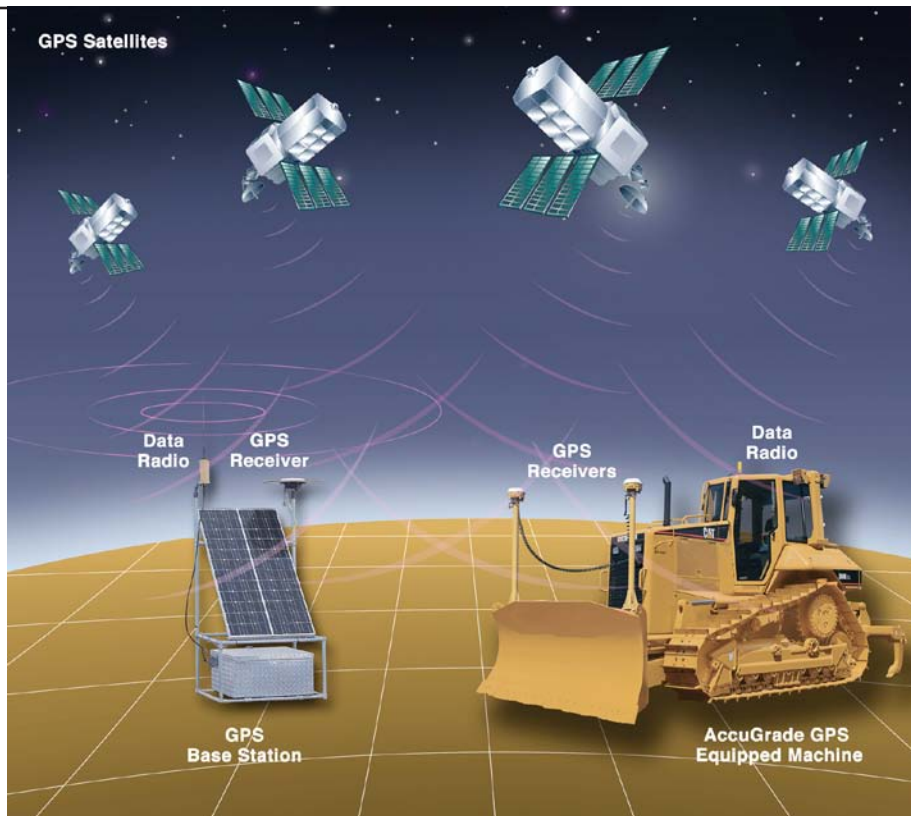
- **Manual Mode** – the operator manually controls the blade, while using cut/fill information on the display and light bars to indicate blade movements.

When used in combination with the trigger, the remote switches also allow the operator to increment/decrement a vertical offset from a design.

**7) Tilt Sensor (AS400C).** The tilt sensor is mounted on the back of the blade. The sensor determines the pitch of the blade and is also used for the valve calibration process.

**Connecting Cables.** The cables provide power to and connect components to the system. The same connections used for AccuGrade GPS are used for the AccuGrade Laser system. The plug and play design makes it easy to change from laser to GPS based systems. Quick disconnects allow easy component connection. Curly CAN cables flex during blade movement.

**Weatherproof Design.** All components are designed rugged for dependable performance in harsh environments. Durable housings environmentally protect the components from dust and weather on tough job sites and in adverse conditions.



## Off-Board Components

**GPS Satellites.** The system uses GPS satellites to send positioning information to the base station GPS receiver and the machine’s GPS receivers. The satellites constantly transmit their positions, identities and times of signal broadcasts for earth-based GPS receivers to use.

The system of 24+ satellites are controlled by the U.S. Department of Defense. The satellites are available worldwide, 24-hours a day, with no charge to users.

**GPS Base Station.** The GPS base station is located within radio range of the work site. It contains a communications radio, GPS receiver and GPS antenna. The horizontal position (latitude, longitude) and the vertical position (height) of the base station are fixed to known reference points. The base station receives information from the GPS satellites. This information, along with the base station’s known position is sent to the machine via the communication radio. This information is used by the machines’ GPS receivers to calculate high accuracy positions.

## Office Components

**3D Design Software.** Flat and sloping planar surface design files can be created on-board the machine using the AccuGrade GPS system. More complex designs require 3D design software. Typically, engineering and surveying firms create these complex 3D site designs.

**Office Software.** The office software manages and converts engineering survey data for use in machine format. It is the interface between the machine system, site managers and design engineers. The design data is exported from the office software onto a data card for use by the AccuGrade GPS system.

Trimble SiteVision™ Office v.5.5 is the recommended software for managing and converting design files.

## Features and Benefits

### Increases Productivity and Efficiency

- Increases productivity by up to 50%
- Reduces guesswork and costly rework by moving dirt right the first time
- Reduces survey costs up to 90%
- Increases material utilization
- Reduces operating costs
- Extends the work day

### Assists with Labor Shortage

- Reduces labor requirements and costs
- Customers can get the job done quicker
- Reduces need for staking, string lines and grade checkers
- Empowers operator to check grade from the cab
- Reduces labor for staking as job progresses

### Improves Employee Satisfaction and Retention

- In-cab display brings the design to the cab
- Provides more responsibility and job satisfaction

- Empowers operator with real-time results
- Real time feedback on progress increases job satisfaction, eliminates guesswork and reduces operator stress
- Improves operator skills and takes performance to the next level
- Investing in the operator provides value and trust by investing in latest technology

### Addresses Safety Concerns

- Removes grade stakers and checkers from the worksite and away from the heavy equipment
- Safety Interlock ensures blade is securely locked when system is inactive

### Increases Equipment Versatility

- Plug and play connections allow fast, easy conversion from laser grade control system, to GPS, to manual control
- Provides consistency and accuracy, turning your production machine into a fine grading machine

### Integrated into Cat Machines

- Proven, optimized on-board electronics and hydraulics systems
- Components designed into machine to maximize reliability
- Integration into cab and joysticks increases ease of use
- Safety interlock (park brake, system health, idle time) increases safety
- Cat Dealer Network provides unmatched service and support.

**Customer Support.** For over 25 years, Caterpillar has been providing electronic and electrical components and systems for the earthmoving industry – real world technology solutions that enhance the value of Cat products and make customers more productive and profitable. Your Cat Dealer is ready to assist you with matching machine systems to the application or obtaining responsible, knowledgeable support.

## Specifications

### CD550A Display

- Display Screen: 140 mm (5.5 in) diagonal, QVGA (320 x 240) color adjustable light level active matrix LCD
- 16 color sunlight readable scratch-resistant low-glare glass
- 17 key backlit keypad with 6 softkeys
- Compact flash memory drive, with heavy duty 64 MB card and compact flash memory card adapter
- Managed power shutdown for file integrity
- Meets Caterpillar EC1 specifications
- Power Input: Input range from 9 to 32 volts, reverse voltage polarity, over voltage and load-dump protected
- Power Consumption: <20 watts
- Operating Temperature: -30°C to 62°C (-22°F to 143°F)
- Humidity: 95% Relative
- Housing: Dustproof, waterproof, shock resistant, fully sealed to  $\pm 5$  psi
- Operating System/Software: WindowsCE v2.12
- Width: 180 mm (7.1 in)
- Height: 228 mm (9 in)
- Depth: 89 mm (3.5 in)
- Weight: 2.72 kg (6 lb)

### MS980C GPS Receiver

- Operating Temperature: -40°C to 70°C (-40°F to 160°F)
- Storage Temperature: -50°C to 85°C (-67°F to 185°F)
- Input Voltage: 9 to 32 V DC

- Maximum Amperage: 1.5 amp
- Horizontal Accuracy: 20 mm (.78 in)
- Vertical Accuracy: 30 mm (1.2 in)
- Initialization: Automatic
- Range: Up to 10 km (6.2 miles) from base station
- Start-up: <2 min.
- 3 LED status indicators  
Upper LED: Power On  
Middle LED: Radio Signal Received  
Lower LED: GPS Signal Received
- Control Interface: SAE J1939 CAN
- Network Connector: 16-pin
- Height: 147 mm (5.8 in)
- Width: 232 mm (9.1 in)
- Depth: 251 mm (9.9 in)
- Weight: 3.8 kg (8.3 lb)

### LB400C Light Bars

- Input Voltage: 10 to 32 VDC
- Operating Temperature: -40°C to 85°C (-40°F to 185°F)
- Storage Temperature: -40°C to 100°C (-40°F to 212°F)
- IP Rating: IP56
- Input Connector: 4-pin
- Height: 174 mm (7 in)
- Width: 53 mm (2 in)
- Depth: 31 mm (1.2 in)
- Weight: .22 kg (0.5 lb)

### AS400C Tilt Sensor

- Electrical Input: 9-32V DC
- Operating Temperature: -40°C to 85°C (-40°F to 176°F)

- Storage Temperature: -40°C to 100°C (-40°F to 176°F)
- Housing: cast aluminum
- Control Interface: SAE J1939 CAN
- Network Connector: 10-pin
- Height: 95 mm (3.7 in)
- Width: 95 mm (3.7 in)
- Depth: 70 mm (2.8 in)
- Weight: 0.8 kg (1.8 lbs)

### Communications Radio

- High speed data rates
- Rugged, waterproof design
- LED status indicators
- Low power consumption
- Power and data provided via a single cable
- Spread spectrum technology
- Range: up to 10 km (6.2 miles ) line of sight under normal conditions
- License-free in US and Canada
- Operating Temperature: -40°C to 70°C (-40°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Humidity: 100% humidity-waterproof
- Radio Antenna Tip: 0db
- Width: 8.6 cm (3.4 in)
- Height 21.6 cm (8.5 in)
- Length: 26 cm (10.3 in)
- Weight: .9 kg (2 lb)

*Radios outside of U.S. and Canada operate on different frequencies. Please contact your Cat Dealer for specifics.*

# AccuGrade GPS Grade Control System Track-Type Tractors

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Featured machines in photos may include additional equipment.  
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